E. M. L.
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INSTRUCTION MANUAL

ES-51-RM

NJE CORPORATION
345 CARNEGIE AVENUE, KENILWORTH, N. J.

INSTRUCTION MANUAL

MODEL ES-51-BM CUSTOM POWER SUPPLY

NJE CORPORATION
345 CARNEIGE AVENUE
KENILWORTH, N. J.
CHESTNUT 1-1500

SECTION I

SPECIFICATIONS

MODEL ES/ELS-51

Input: 208/220 volts, 60 cycles per second, 3 phase, at approximately 8 amperes, 85 % power factor, at full load.

Output: Continuously variable by front panel control from 0 to 160 volts DC at 0 to 10 amperes.

Ripple: 1% RMS maximum.

Regulation: Line, ±0.5% for line voltage variations of ±10%. (Line regulated units only).

Load, 10 % (of maximum output voltage rating) no load to full load.

SECTION 2

THEORY OF OPERATION

The information in this section applies in general to all conventional metallic rectifier power supplies. Specific circuit details pertaining to this power supply should be obtained, after reading this theoretical treatment, from the circuit diagram at the rear of the manual.

The elements of a metallic rectifier power supply are as follows: (Refer to figure 1).

1. A variable autotransformer, whose output voltage is adjustable from zero to approximately 120% of the input voltage value. In three-phase units a separate autotransformer is used for each phase, and the three rotors are ganged to one control shaft.

2. A transformer-rectifier circuit that steps the input voltage up or down as required to provide the rated range of output voltage, and converts the AC current to pulsating direct current. The rectifier circuit used will depend upon the current range of the unit. It will be a full-wave centertapped configuration in light-current supplies, and a full-wave bridge, three-phase half wave, or six-phase star configuration in heavy-current units.

3. A low-pass, single-section, choke-input filter, designed to suppress the ripple component in the pulsating DC voltage.

4. A heavy-duty bleeder resistor. This bleeder "pre-loads" the metallic rectifier, so that a minimum current is drawn even when the external load is disconnected. At very light loads the rectifier exhibits a greater variation in its internal voltage drop, for a given change in load current, than it does at heavier loads. The bleeder, by imposing an initial load, thus causes the rectifier to be operated in a load region which results in less load regulation by the rectifier. (In cases where the external load is permanently connected to the supply, this bleeder resistor can be disconnected, thereby making an additional amount of current available for use in the load, with no sacrifice in regulation.) In addition to acting as an initial load, the bleeder resistor also assures rapid discharge of the filter capacitors, removing the shock hazard for personnel inspecting or maintaining the equipment after shutdown.

In this "brute-force" type of DC power supply, tight load regulation is achieved through the use of low-resistance transformers and chokes, and heavily-derated rectifiers.

The total series resistance is low, and the resultant voltage drop due to the passage of the load current is correspondingly small. The change in load voltage, as the load current is varied from zero to maximum, is consequently a relatively small one. There is no compensation for line voltage changes, however, and a line variation of a given percentage will result in a DC output voltage change of the same percentage. This effect is unimportant in many applications, where line variations would have an adverse effect, the "ELS" or "ELG" models are employed. These units are provided with one or more line voltage regulating transformers ahead of the variable autotransformer. The output of the regulating transformer varies less than 0.5% for an input variation of 10%, and thus provides a very steady AC source for the power supply circuit.

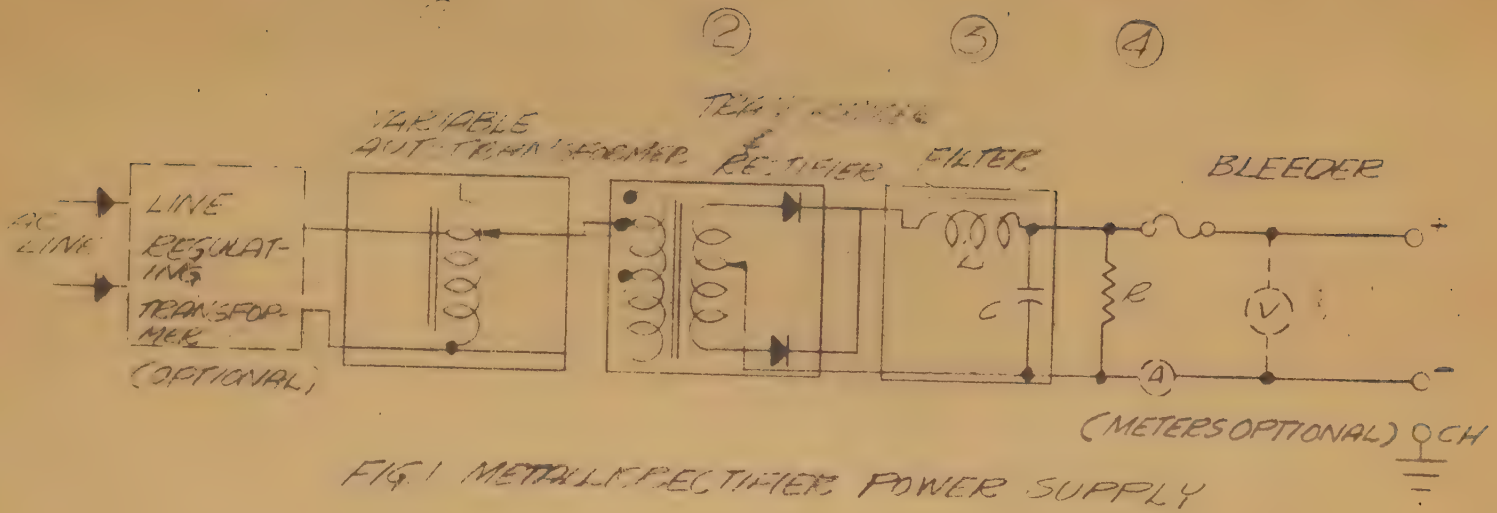


FIG 1 METAL RECTIFIER POWER SUPPLY

MAINTENANCE PROCEDURES

ES or EU Power Supplies require very little preventative maintenance.

1. [illegible] loose connections or worn insulation.

2. Remove cabinet, covers and/or bottom plate, and inspect the circuitry for dust or dirt deposits (which should be blown or brushed away) and remove foreign objects, such as hardware or small components, which may have fallen in through the ventilating spaces during bench use. Look for signs of overheating, which may indicate overloading due to misuse or malfunctioning of the circuit.

3. Check that chassis-mounted components are securely held in place by their clamps or brackets. Wipe them with a soft cloth to remove heavy dust deposits.

4. [illegible] for looseness. Tighten carefully, preserving alignment.

5. Check calibration and zeroing of meters, if any.

6. [illegible]

7. [illegible] instrument as follows:

8. Rough regulation check: Operate supply from a 115 volt line. Set supply to approximately midrange. Monitor output with external [illegible] as recommended, under circumstances, for a meaningful check. This meter should read at least mid-scale at mid-range of the supply, so [illegible] alternately connect and disconnect an external load (of appropriate rating and resistance to [illegible] selected) observing the voltmeter for steady-state changes. If the output varies more than the product of nameplate regulation [illegible]

[illegible] of all conventional power supplies is such that they [illegible] is suddenly applied. [illegible] the load back put to general [illegible]

output ripple by means of a low-range AC voltmeter
the DC output by means of a 0.1 microfarad capacitor.
e, check the capacitor bank for blown fuses or "open"
Examination of the waveform by oscilloscope at the
rminal of the filter choke should show smooth half-sine-
atterns for each rectified phase. A notch in the wave-form
as a defective choke, while absence of any phase indicates
tive rectifier.

WARNING!!

ALL NIE POWER SUPPLIES PRODUCE
VOLTAGES DANGEROUS TO LIFE!
EXERCISE EXTREME CARE IN PERFORMING
VOLTAGE MEASUREMENTS!

[illegible] component failures in NIE Regulated Power Supplies will be limited [illegible] load fuses by the conservative circuit design employed in their [illegible]. The following general hints should be of assistance in locating [illegible]

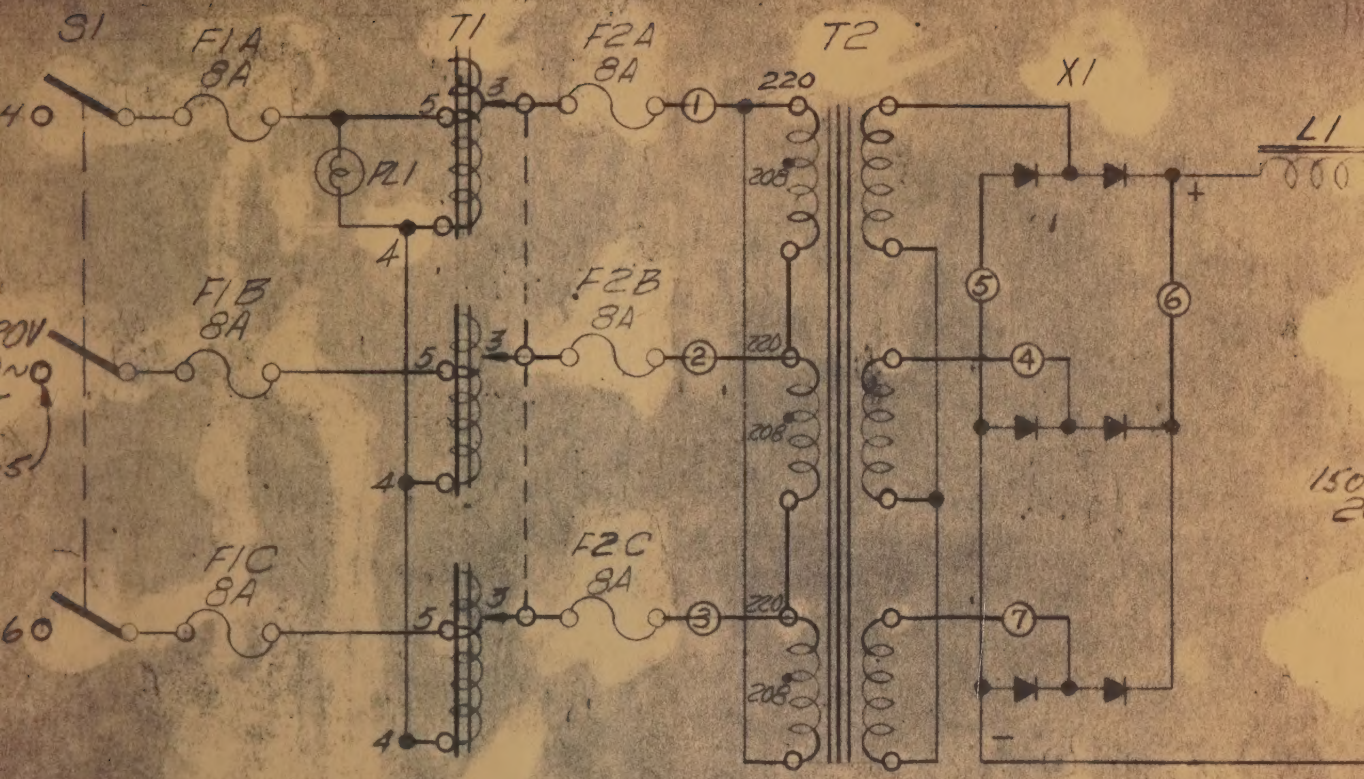
[illegible]

b. [illegible] voltmeter.

[illegible] or which it was designed, but it will not regulate properly [illegible] entire current range under these conditions.

[illegible] scale used for measurement of 115 volts AC. NIE [illegible] effectively down to 105 volts RMS, but below that value [illegible] their ability to regulate full load currents.

[illegible] power supply, as in any other electronic device.


S1
F1A
8A
T1
F2A
8A
T2
X1
L1
40
5
3
220
208
4
P.I
F1B
8A
F2B
8A
220
208
4
5
3
2
4
6
150
F1C
8A
F2C
8A
60
5
3
220
208
4
7
+
—

ALL WIRE #12 AWG.

1-6 PART OF TB1

①-⑧ PART OF TB2 & TB3

SCHEMATIC

4-16-56

S-ES-51-RM 2

TPM
2/15/56

OUR WARRANTY: N J E Corp. warrants each power supply manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replacing any defective parts thereof, except tubes and fuses in "standard-grade" models. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

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